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DYNAMICS OF ACHIEVEMENT: DIFFERENTIAL GROWTH OF ACHIEVEMENT FOR NEGRO AND WHITE STUDENTS BY SMSA/NON-SMSA AND REGION.

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When comparisons of average test score results or grade level equivalents are made in terms of Negro and white students by standard metropolitan statistical areas (SMSA), non-SMSA, and within regions, white students in every region, regardless whether metropolitan or nonmetropolitan, have higher average scores in every type of test at every grade level. For any given group of regions, Negro students show much more variability by region in average test scores than do white students. Both Negroes and white students exhibit ever-increasing variability across regions in average test scores as they progress from grade to grade, but Negro students show a greater variability. In comparing the possible influence on achievement of metropolitan versus regional residence, for Negroes, it has been found that regional differences have an increasingly greater long-term influence. For white students, metropolitan or nonmetropolitan residence appears to be a more important factor than regional differences in the achievement of superior test scores. (NH)

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by

Tetsuo Okada
David S. Stoller

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DYNAMICS OF ACHIEVEMENT: DIFFERENTIAL GROWTH OF ACHIEVEMENT FOR NEGRO AND WHITE STUDENTS BY SMSA AND NON-SMSA AND REGION

INTRODUCTION

In Technical Note No. 53 [1] results of the Educational Opportunity Survey[2] were presented for Negro and white students as well as for various racial minorities. This review presents the Negro and white students' average test results in terms of SMSA and Non-SMSA for the various regions of the United States.

For SMSA schools, the various regions are defined as follows:

NE -	Connecticut	Maryland	New York
	District of Columbia	Massachusetts	Pennsylvania
	Delaware	New Hampshire	Rhode Island
	Maine	New Jersey	Vermont
MW -	Illinois	Michigan	North Dakota
	Indiana	Minnesota	Ohio
	Iowa	Missouri	South Dakota
	Kansas	Nebraska	Wisconsin
SE -	Alabama	Kentucky	South Carolina
	Arkansas	Louisiana	Tennessee
	Florida	Mississippi	Virginia
	Georgia	North Carolina	West Virginia

1/ Okada, T., Stoller, David S., and Weinfeld, F.D., Dynamics of Achievement: A Study of Differential Growth of Achievement Over Time. Technical Note Number 53, Division of Operations Analysis, National Center for Educational Statistics, U.S. Office of Education, January 1968.

2/ James S. Coleman, et.al., Equality of Educational Opportunity, (OE-38001) U.S. Department of Health, Education, and Welfare, National Center for Educational Statistics, U.S. Government Printing Office. Washington, D.C.: 1966, Catalog No. FS5.38001, and Supplement.

SW - Arizona
New Mexico
Oklahoma
Texas

W - Alaska, California, Colorado, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming

For non-SMSA schools the regions and their states are:

SE - Same as above

SW - Same as above

N+W - All states not in the SE or SW regions.

The following table shows the percent in each region of the total number of children, aged 5 to 19, in the United States.3/

	SMSA		Non-SMSA	
	Negro	White	Negro	White
NE	16%	20%		
MW	16	19		
SE	27	14	27%	14%
SW	4	3	4	2
W	4	11		
N+W	36	50	2	17
TOTALS	67%	67%	33%	33%

3/ Coleman, ibid.

DISCUSSION

A few very general observations may be made concerning the results of the Educational Opportunity Survey when average test scores for Negro and white students are broken down by region and SMSA-Non-SMSA. (Figures 1 through 6). In every instance, at all grades and all regions, average white scores are higher than average Negro scores. In almost all comparisons, the average white scores for the various regions for any given test run in a fairly tight band from grades 6 to 12 whereas equivalent average Negro scores widen appreciably from grade 6 to grade 12. At grade 12 both groups show more dispersion of average scores across regions than at grade 6 but the Negro average scores show much more variability across regions than white average scores.

1. Geographic Regions

When comparisons are made in terms of geographic regions there is a wider dispersion of average test scores among regions for Negroes than whites for all tests. This is illustrated in Figures 1 through 6 in which average test scores for each type of text are plotted for the various regions.

In terms of test score points at the 12th grade, the difference in average scores between the highest scoring region and the lowest scoring region for the various categories are:

	Negro	White
Reading SMSA	7.9	4.0
Reading Non-SMSA	6.3	2.4
Verbal SMSA	6.7	3.8
Verbal Non-SMSA	6.6	3.4
Math SMSA	4.9	3.2
Math Non-SMSA	4.7	1.6

Thus, there is a greater variability across regions of average test scores for Negroes than whites for all tests in both SMSA and Non-SMSA.

2. SMSA Vs. Non-SMSA

A variability in average test scores occurs also within a given region when SMSA and Non-SMSA averages are compared for Negro, and white students (Tables 1 - 3). For example (Table 1), for the SE region, at grade 12, the difference in average scores between SMSA SE and Non-SMSA SE for Negroes for Reading Ability is approximately 6 test points. The same differenc e in averages for whites is less than 3 points. This difference in SMSA/non-SMSA is consistent for most tests, regions, and grades.

For Negroes, for a given region, all SMSA average scores are higher than non-SMSA average scores except for the following: 9th grade math for the N+W region and 12th grade math for the SW region. For whites, SMSA average scores are also generally higher than Non-SMSA average scores. The exceptions occur with the SW non-SMSA students achieving higher average scores in grades 6 and 9 in all three tests.

When the difference is taken for SMSA and Non-SMSA average test scores for a given region, the following table (grade 12) is an example of the variability of average scores within a given region by metropolitan concentration:

Grade 12

	Region	Negro SMSA-Non-SMSA Difference	White SMSA-Non-SMSA Difference
Reading	SE	6.0	2.8
	SW	2.0	0.4
	N+W	4.5	1.2

	Region	Negro SMSA-Non-SMSA Difference	White SMSA-Non-SMSA Difference
Verbal	SE	6.2	2.9
	SW	2.5	0.1
	N+W	4.4	2.5
Math	SE	2.6	0.5
	SW	-0.9	0.4
	N+W	0.7	1.6

Thus, again Negro average scores show much more variability by metropolitan concentration than white average scores, and this greater variability is generally consistent for all tests, all regions, and grades. The SE region, in particular, shows the greatest difference in SMSA-Non-SMSA average scores.

3. Metropolitan vs. Regional Differences

In comparing regional vs. SMSA/non-SMSA differences (Figures 7, 9, and 11) it is essential to note that for Negroes:

(1) For the SE and SW regions SMSA scores are higher than non-SMSA scores in every instance except for 12th grade mathematics;

(2) Yet the N+W non-SMSA scores are always higher than the SE or SW SMSA scores for grades 9 and 12.

Thus Negroes who attend school in a particular region (namely N+W Non-SMSA), even though non-metropolitan, attain higher achievement scores than Negroes living in metropolitan areas in the SE or SW.

For the white students, however, those who live in non-metropolitan areas, regardless of geographic location possess lower average

achievement scores by grade 12 than those who live in any of the metropolitan areas (Figures 8, 10, and 12). For example, although at grades 6 and 9 the N+W Non-SMSA average test scores are higher than those for SE SMSA and SW SMSA in all three tests, by the 12th grade the SE and SW SMSA average scores are higher than the N+W Non-SMSA average scores in all instances (except for SE average mathematics scores.)

Thus, a hypothesis that may be advanced from these observations is that for whites, metropolitan residents attain higher average achievement scores than non-metropolitan residents regardless of region, whereas for Negroes, regional differences have an increasingly greater long-term influence on the attainment of higher average achievement scores than metropolitan non-metropolitan differences.

4. SMSA/NON-SMSA Rank Comparisons

If average test scores for reading comprehension (R), verbal ability (V), and mathematics (M) for each region are arranged according to the rank they occupy for each of these tests, then the following type of table results:

Negro, Grade 12

	RANK					
	1	2	3	4	5	6
N+W SMSA	R,V,M					
SE SMSA			R,V	M		
SW SMSA				R,V	M	
N+W Non-SMSA		R,V,M				
SE Non-SMSA						R,V,M
SW Non-SMSA			M		R,V	

The above table shows for example, that the Negro students in grade 12 living in the SE SMSA region ranked number 3 in average test scores in reading and verbal ability and ranked number 4 in mathematics. Similarly, the SE Non-SMSA Negro students were the lowest in all three tests.

Tables 10 and 11 show the rankings for Negro and white students living in each of the specified regions for grades 6, 9 and 12 according to the average test scores received in the three tests. The total figures in Table 12 shows the number of times each region ranked in all three tests. When these are weighted by the product of rank and frequency of occurrence at each rank the following table showing overall rank based on all tests at all grades results:

RANK NO.	NEGRO	White
1	N+W SMSA	N+W SMSA
2	N+W Non-SMSA	N+W Non-SMSA
3	SW SMSA	SW Non-SMSA
4	SE SMSA	SE SMSA
5	SW Non-SMSA	SW SMSA
6	SE Non-SMSA	SE Non-SMSA

For Negro students, ranks 1, 2, 5 and 6 are relatively well defined, but ranks 3 and 4 are very close together. For white students, only ranks 1 and 6 are clearcut; N+W Non-SMSA and SW Non-SMSA are tied for third place and SE SMSA and SW SMSA are too close together to be ranked individually.

These rankings reaffirm the statements made earlier: that Negroes living in the N+W region, regardless of whether metropolitan or not, attain higher achievement levels than Negroes living in the SE or SW. Further, these rankings show that within the SE or SW region, Negro students living in SMSA areas achieve at a higher level than students living in non-SMSA areas.

For white students the rankings do not reflect the statement made earlier concerning the ever-increasing importance of living in SMSA areas. This is due principally to the fact that the rankings, except for first and last place, are too close together to permit any definitive statement.

GRADE LEVEL EQUIVALENT COMPARISONS

In terms of grade level equivalents, Tables 4 through 6 reflect the preceding test score results. Negro students living in metropolitan areas show an average gap at grade 12 of 1.7 to 3.1 years for reading (Table 7), 2.3 to 3.4 years in verbal ability (Table 8), and 3.8 to 4.8 years in mathematics (Table 9). Comparable figures for non-SMSA Negroes are 2.8 to 3.9 years, 3.3 to 4.3 years, and 4.3 to 5.2 years, respectively.

In these same tests, white SMSA students on the average are ahead of the national mean grade level equivalents (defined as 6.0 years for grade 6, 7.0 years at grade 7, etc.) by 0.4 to 1.4 years in reading, greater than 1.4 years* for all regions in verbal ability, and greater than 0.6 years* in mathematics at grade 12.

For Negro Non-SMSA average scores at grade 12, reading comprehension scores are 2.8 to 3.9 years behind the national mean scores. Similar figures for verbal ability and mathematics are 3.3 to 4.3 years and 4.3 to 5.2 years behind, respectively.

Depending on region, white non-SMSA average scores range from 0.2 to 0.8 years ahead of the national mean scores for reading comprehension. For verbal ability, the average scores for the same group range from 0.2 years behind to 1.4 years or more ahead of the national

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*For some grades, grade level equivalents are denoted by an asterisk (*) in Tables 5 and 6 to indicate the fact that grade level equivalents are not calculable from national mean scores since the two curves for individual and national mean scores do not intersect (see page 38 .) The "greater than" figures noted above refer to the least possible grade level equivalent at which intersection occurs; these grade level equivalents are undoubtedly much higher than the minimum figures quoted.

mean scores. And in mathematics, the average test scores for this group are at least 0.6 years ahead of the national mean scores. It is interesting to note that the SE non-SMSA verbal ability scores at grades 9 and 12 are the only average scores among white students which are lower than the national mean scores.

CONCLUSION

When comparisons of average test score results or grade level equivalents are made in terms of Negro and white students by SMSA/non-SMSA and within regions, the white students in every region, regardless whether metropolitan or non-metropolitan, have higher average scores in every type of test at every grade level.

For any given group of regions, Negro students show much more variability by region in average test scores than do white students. Both Negroes and white students exhibit an ever-increasing variability across regions in average test scores as they progress from grade to grade but the Negro students show a greater variability.

In comparing the possible influence on achievement of metropolitan versus regional residence, for Negroes, regional differences have an increasingly greater long-term influence. For white students, metropolitan or non-metropolitan residence appears to be a more important factor than regional differences in the achievement of superior test scores.

Figure 1

Negro and White SMSA Reading Comprehension Test Scores
by Region, Grades 6 - 12

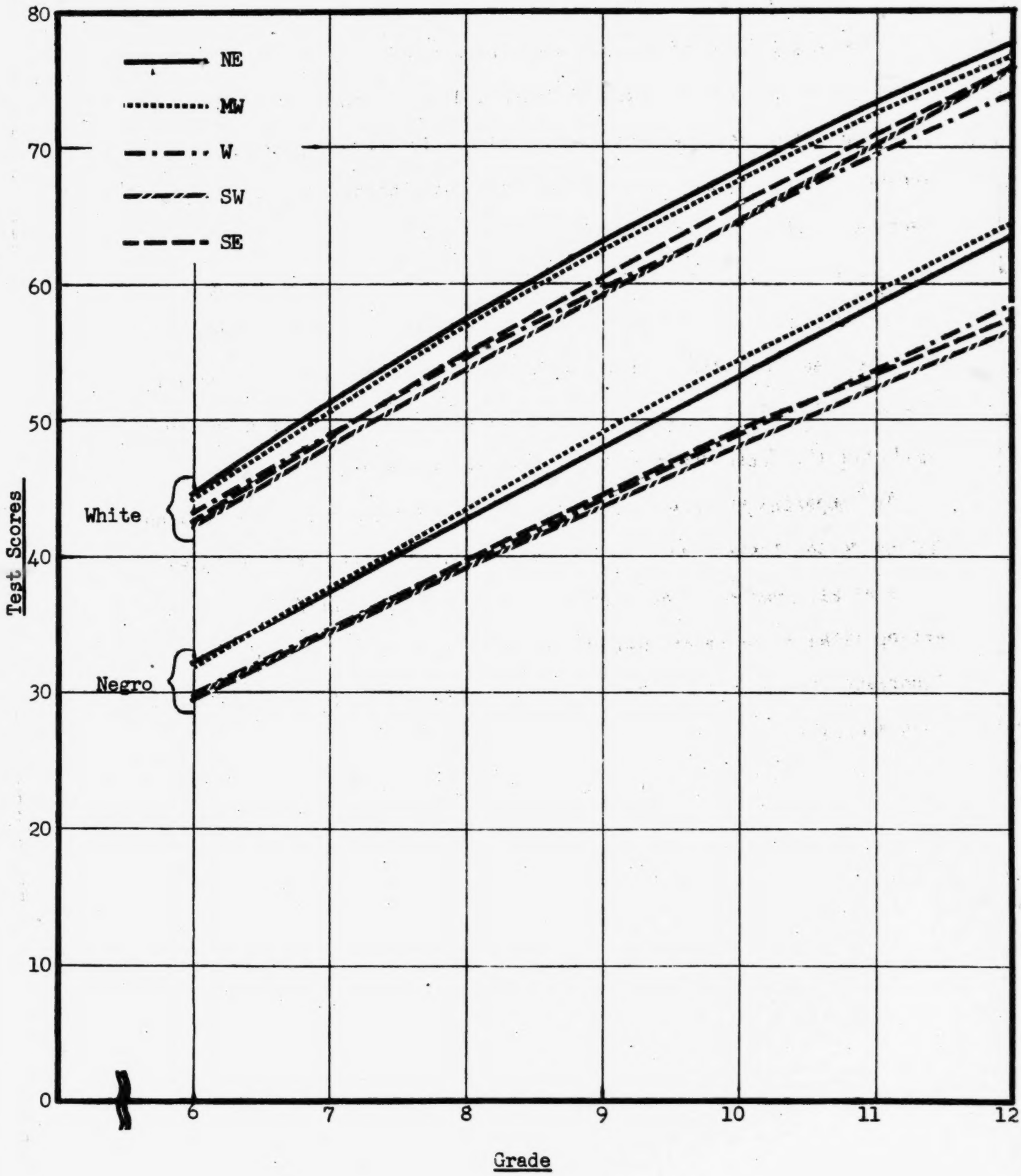


Figure 2

Negro and White Non-SMSA Reading Comprehension Test Scores by Region, Grades 6 - 12

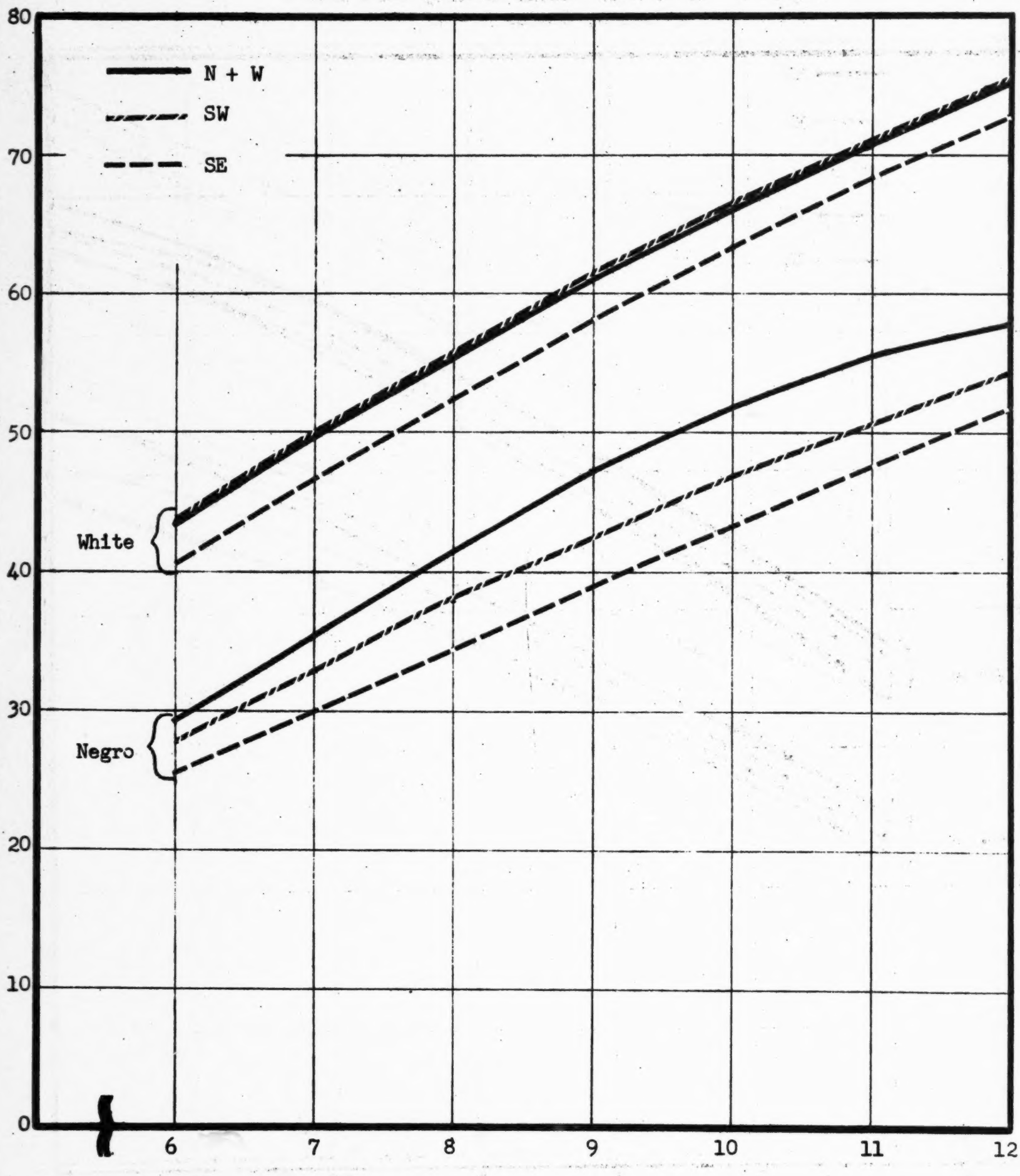


Figure 3

Negro and White SMSA Verbal Ability Test Scores
by Region, Grades 6 - 12

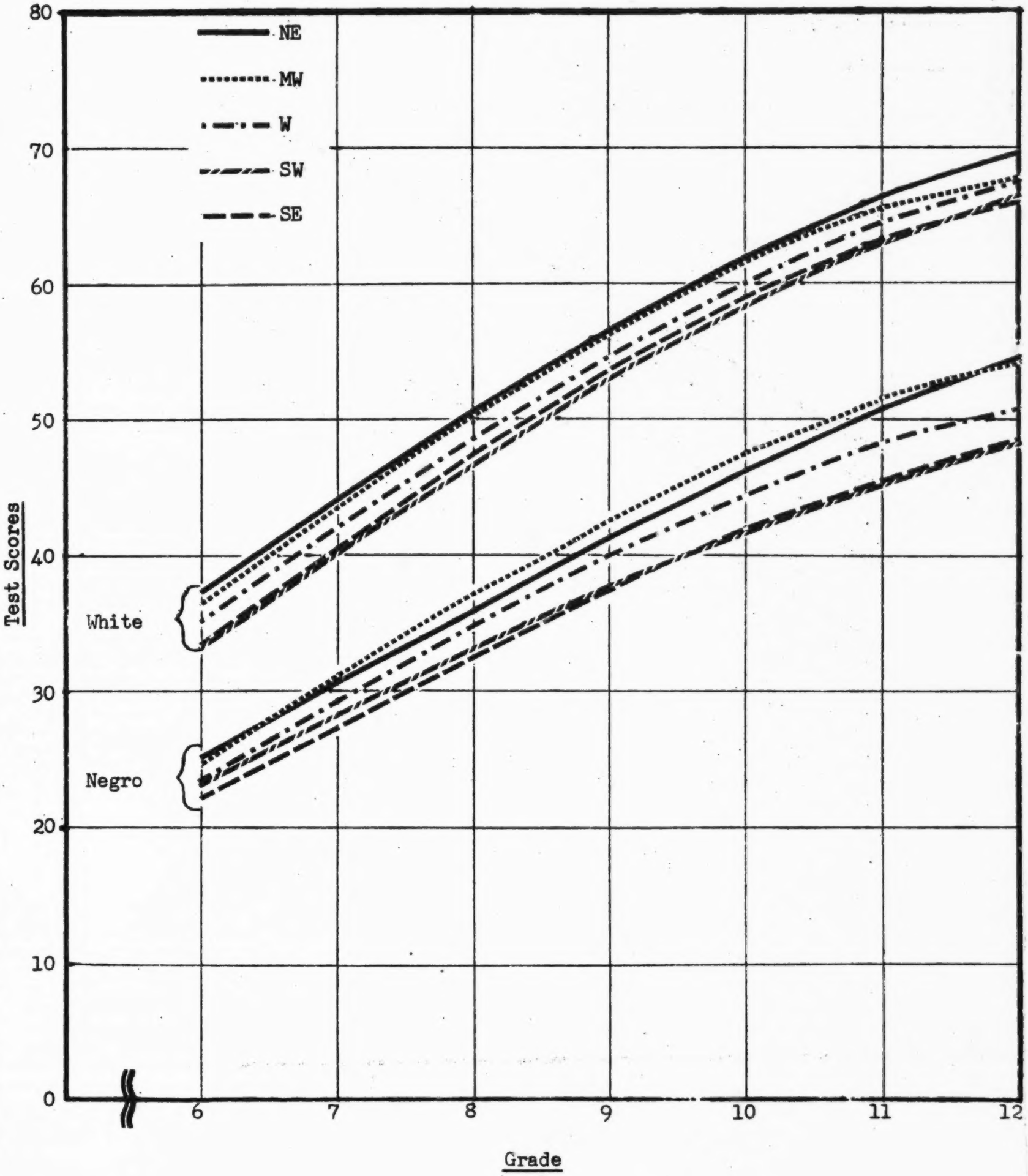


Figure 4
Negro and White Non-SMSA Verbal Ability Test Scores
by Region, Grades 6 - 12

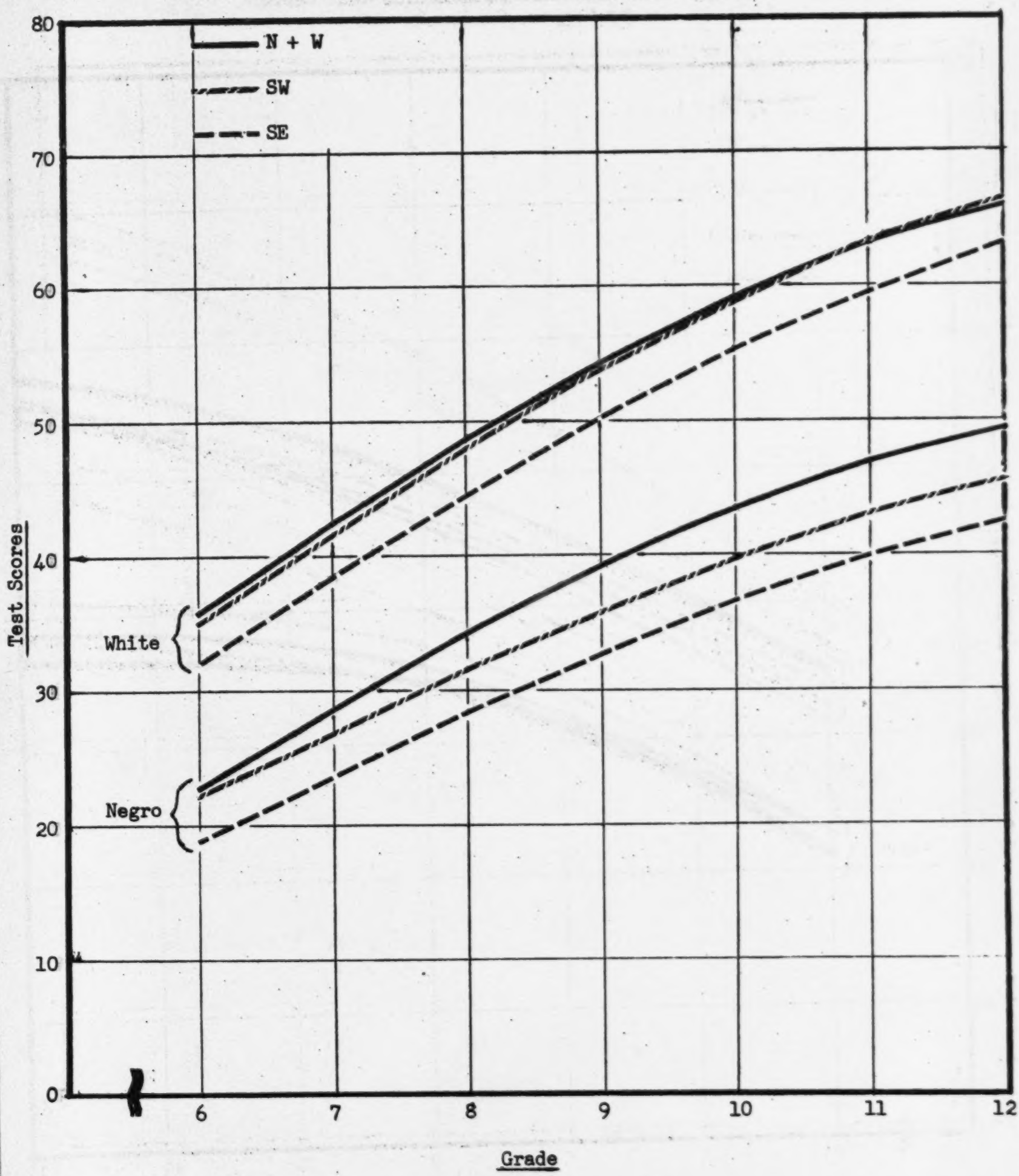


Figure 5
Negro and White SMSA Mathematics Test Scores
by Region, Grades 6 - 12

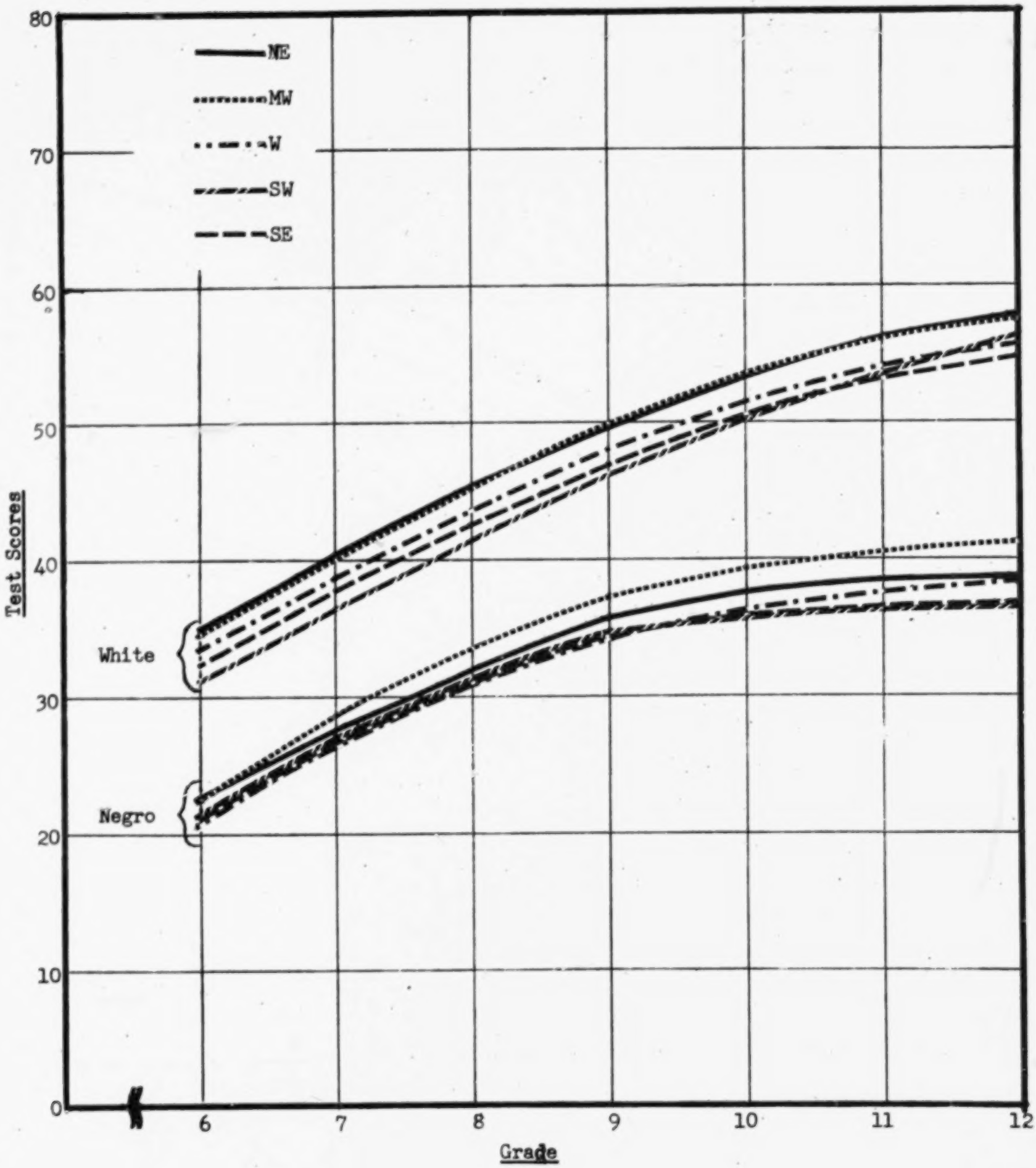


Figure 6

Negro and White Non-SMSA Mathematics Test Scores
by Region, Grades 6 - 12

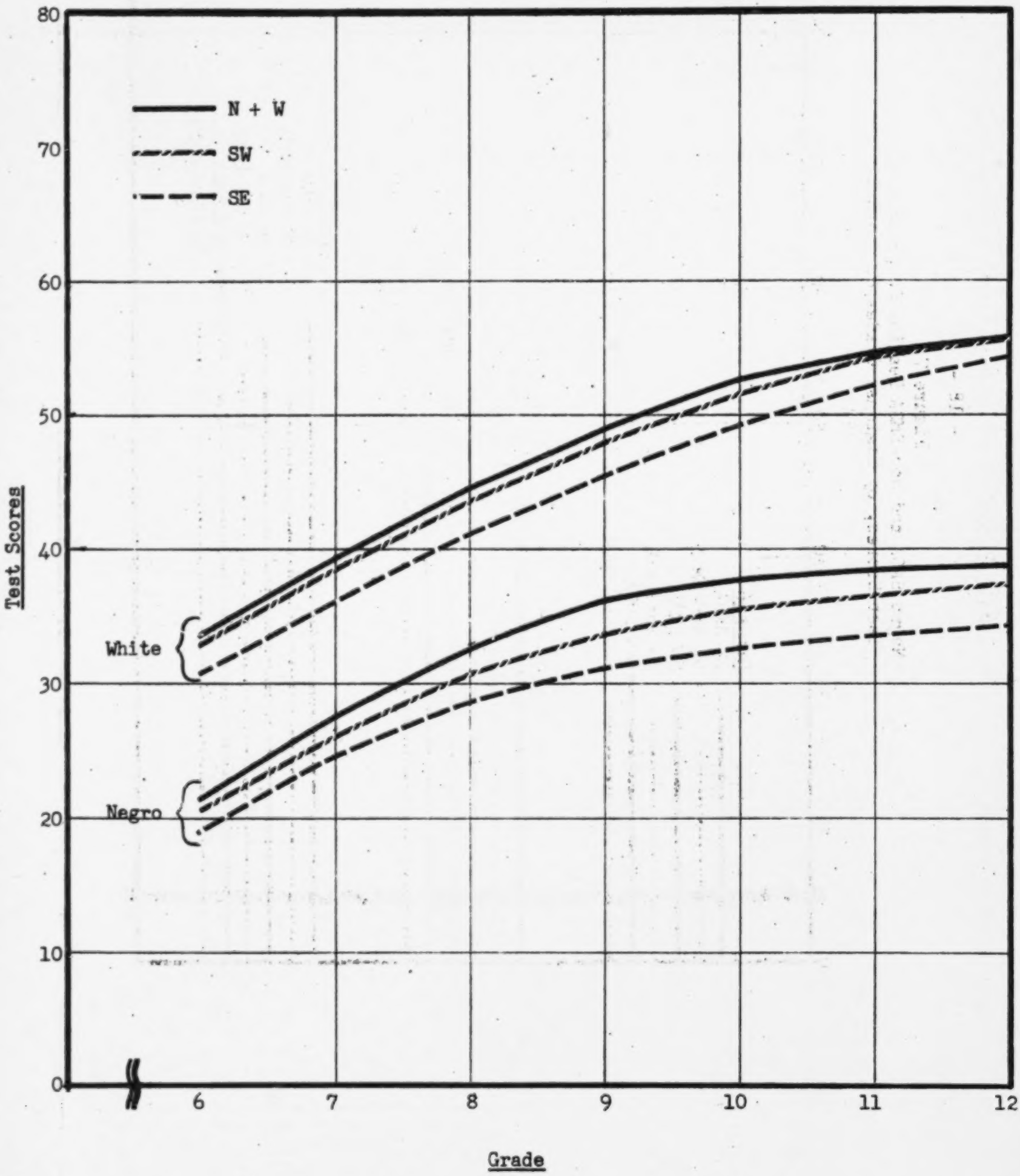


Figure 7
Negro SMSA and Non-SMSA Reading Comprehension
Test Scores, by Regions; Grades 6, 9 and 12

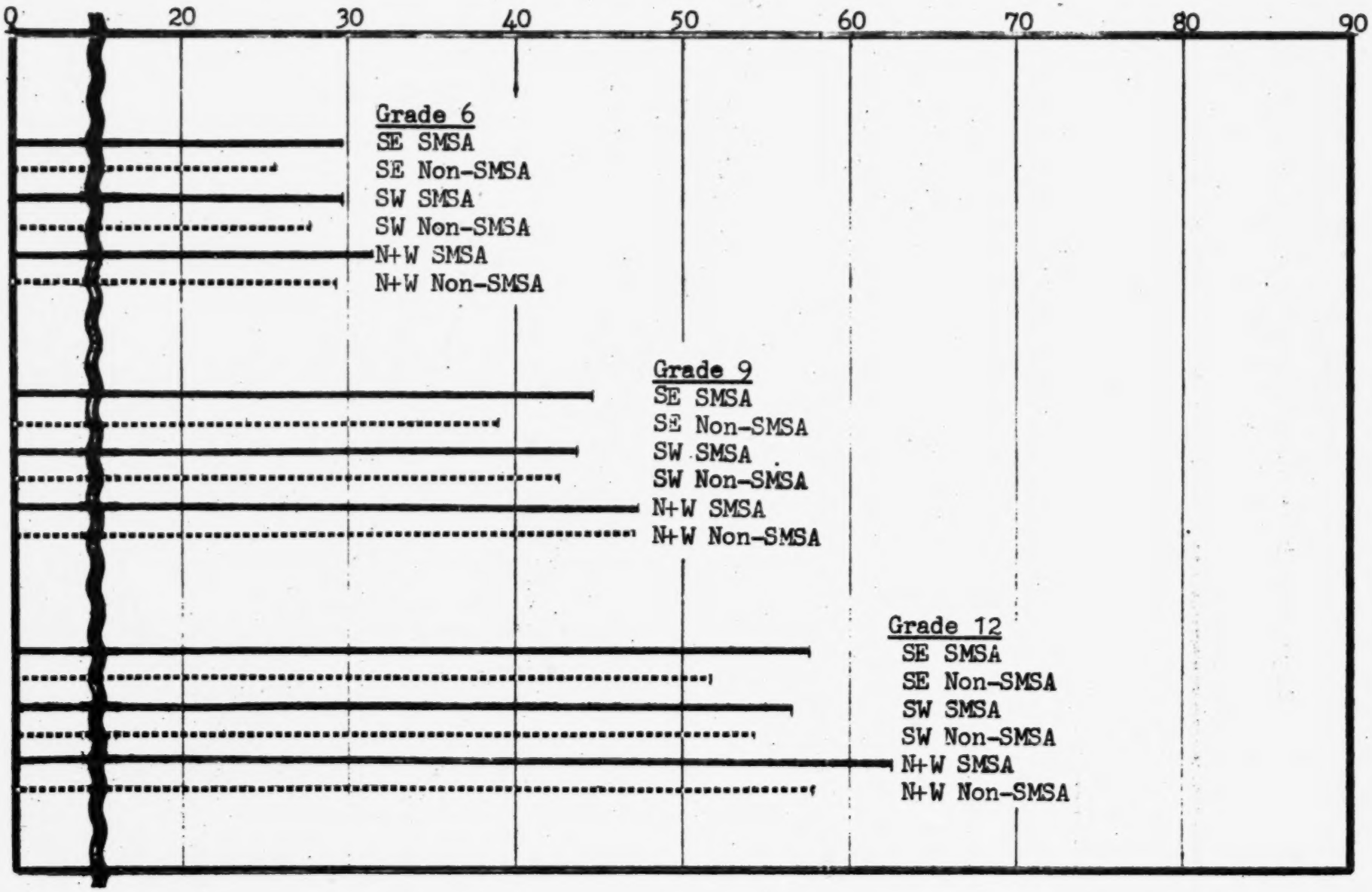


Figure 8
White SMSA and Non-SMSA Reading Comprehension
Test Scores, by Regions; Grades 6, 9 and 12

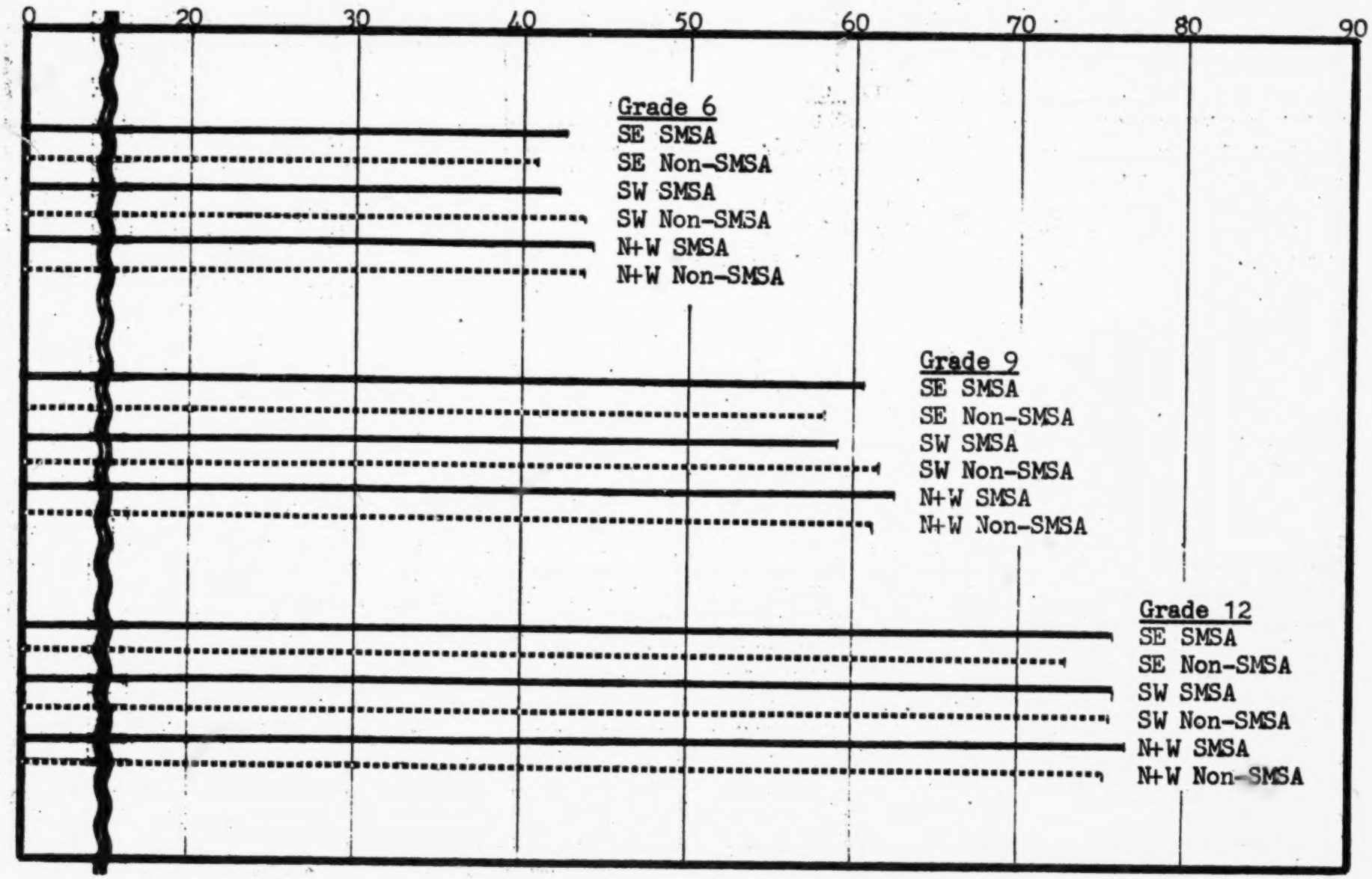


Figure 9
Negro SMSA and Non-SMSA Verbal Ability
Test Scores, by Regions; Grades 6, 9 and 12.

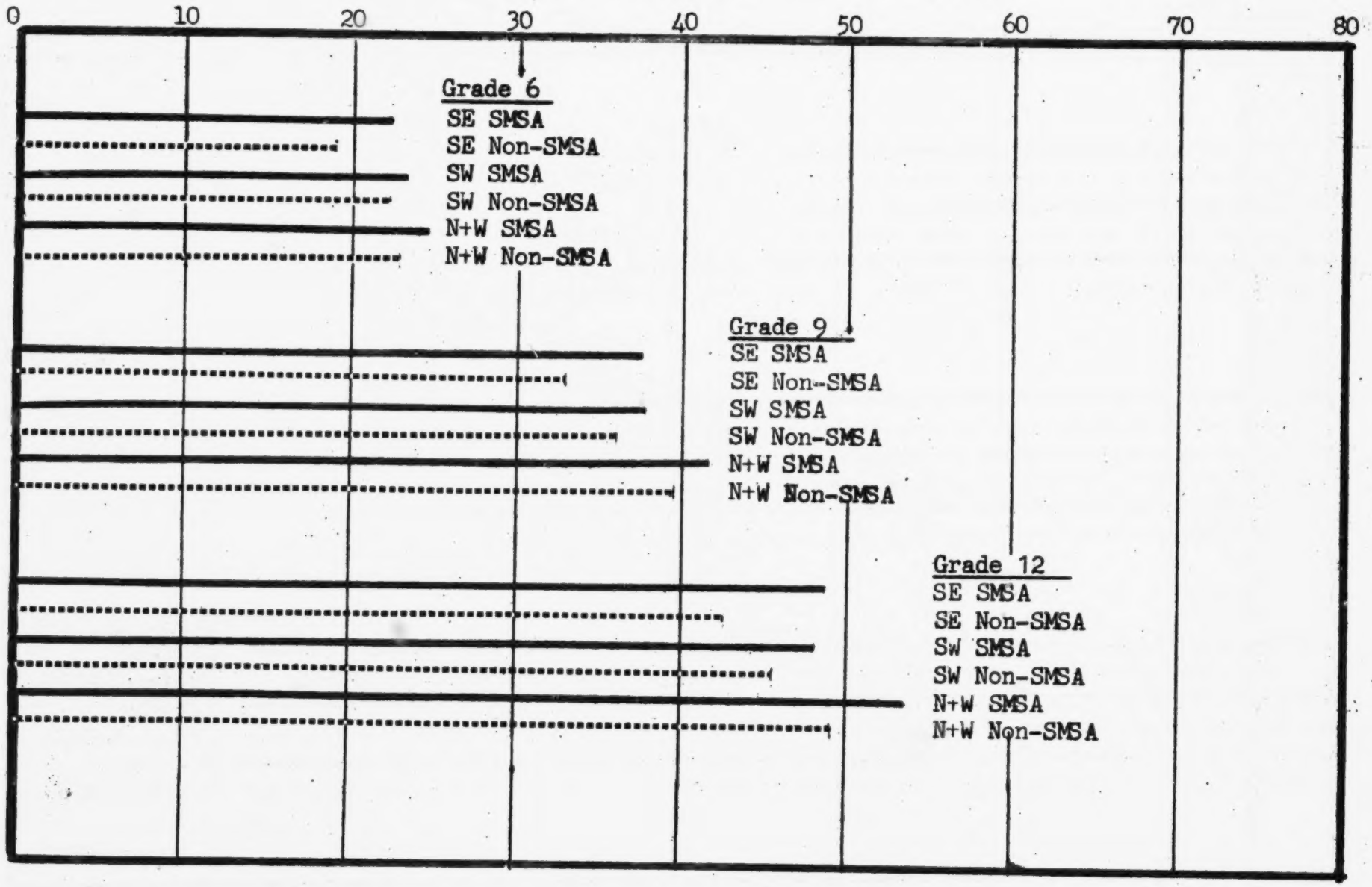


Figure 10

White SMSA and Non-SMSA Verbal Ability
Test Scores, by Regions; Grades 6, 9 and 12.

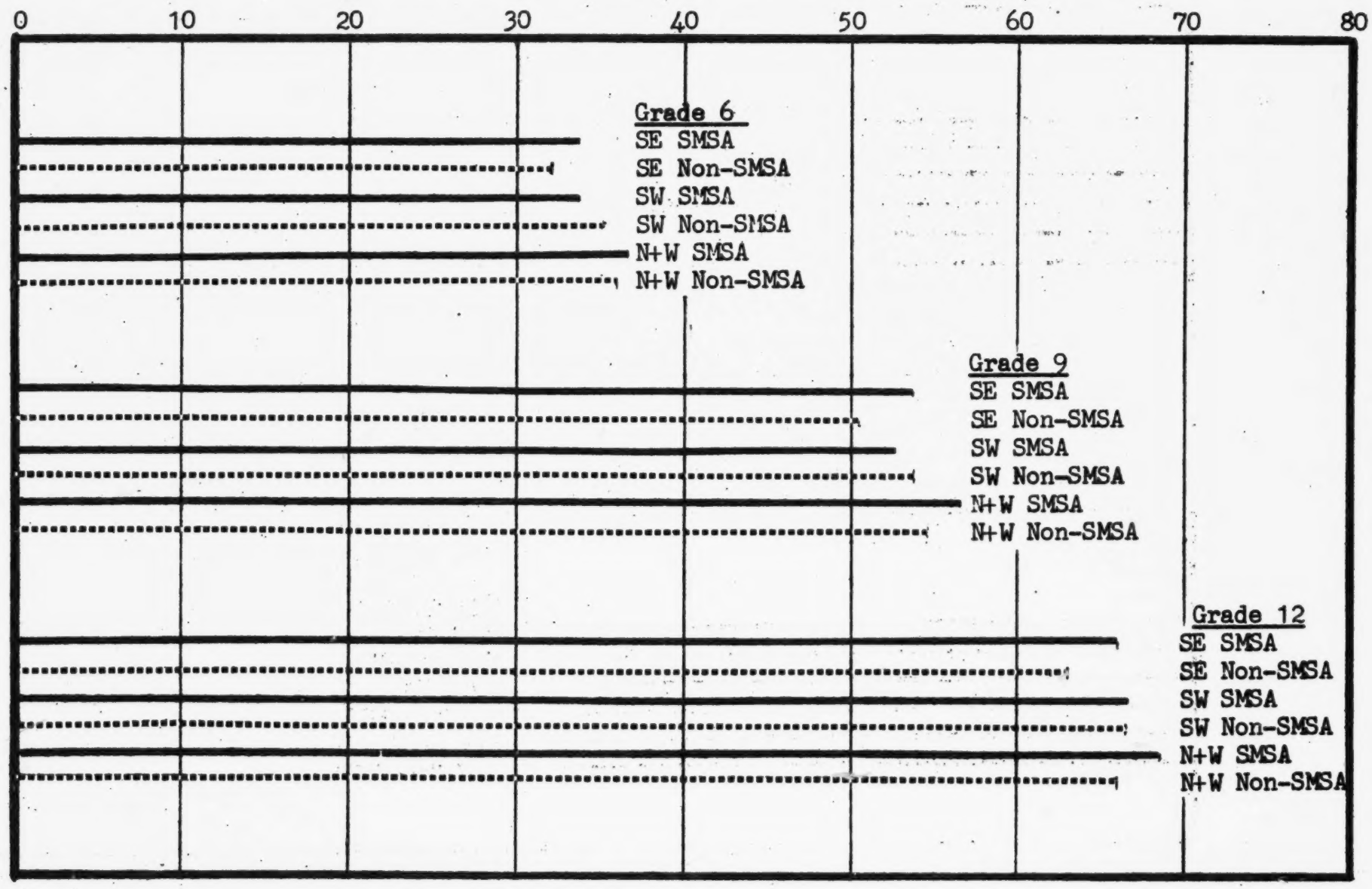


Figure 11

Negro SMSA and Non-SMSA Mathematics
Test Scores, by Regions; Grades 6, 9 and 12

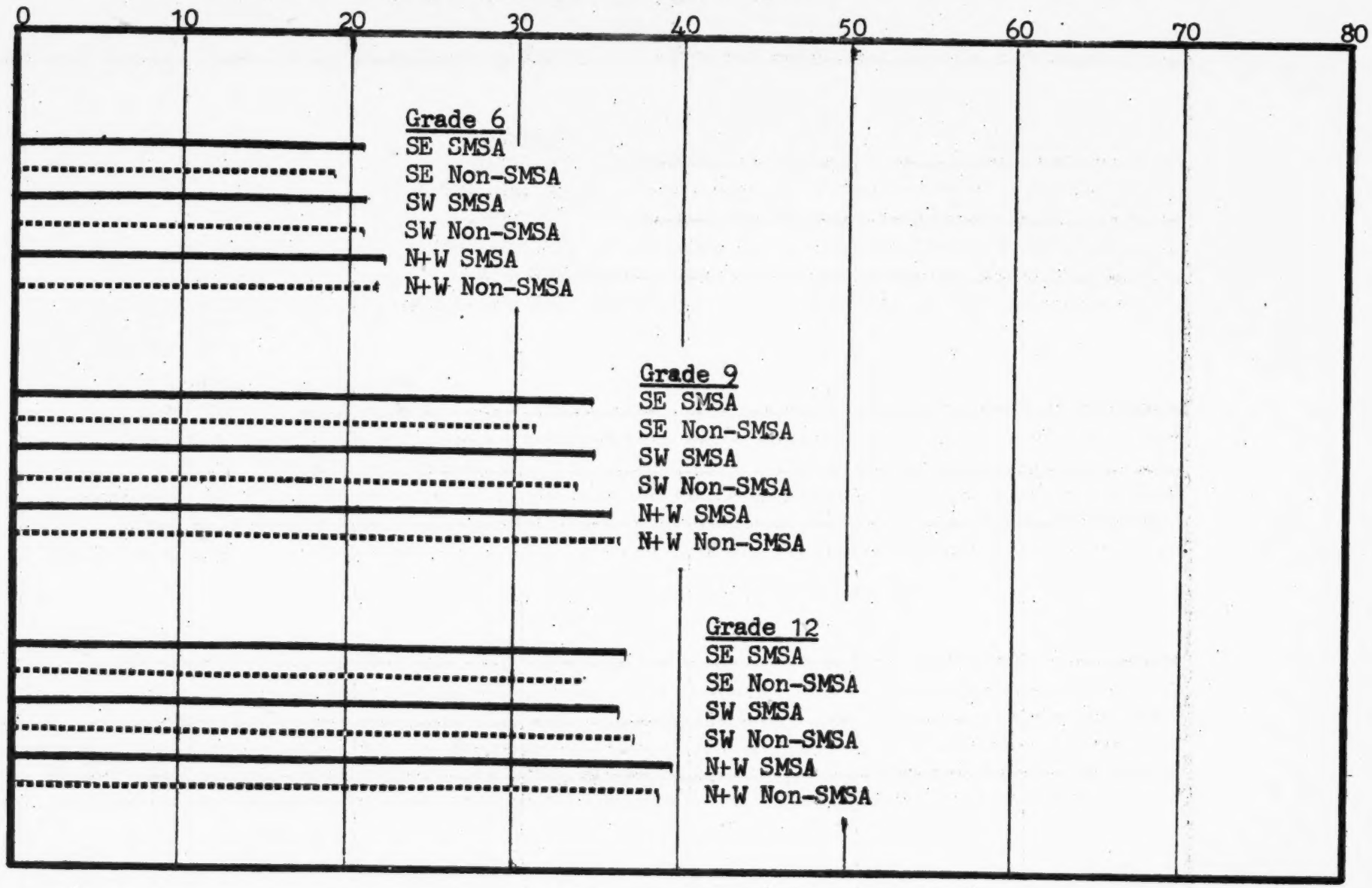


Figure 12

White SMSA and Non-SMSA Mathematics
Test Scores, by Regions; Grades 6, 9 and 12

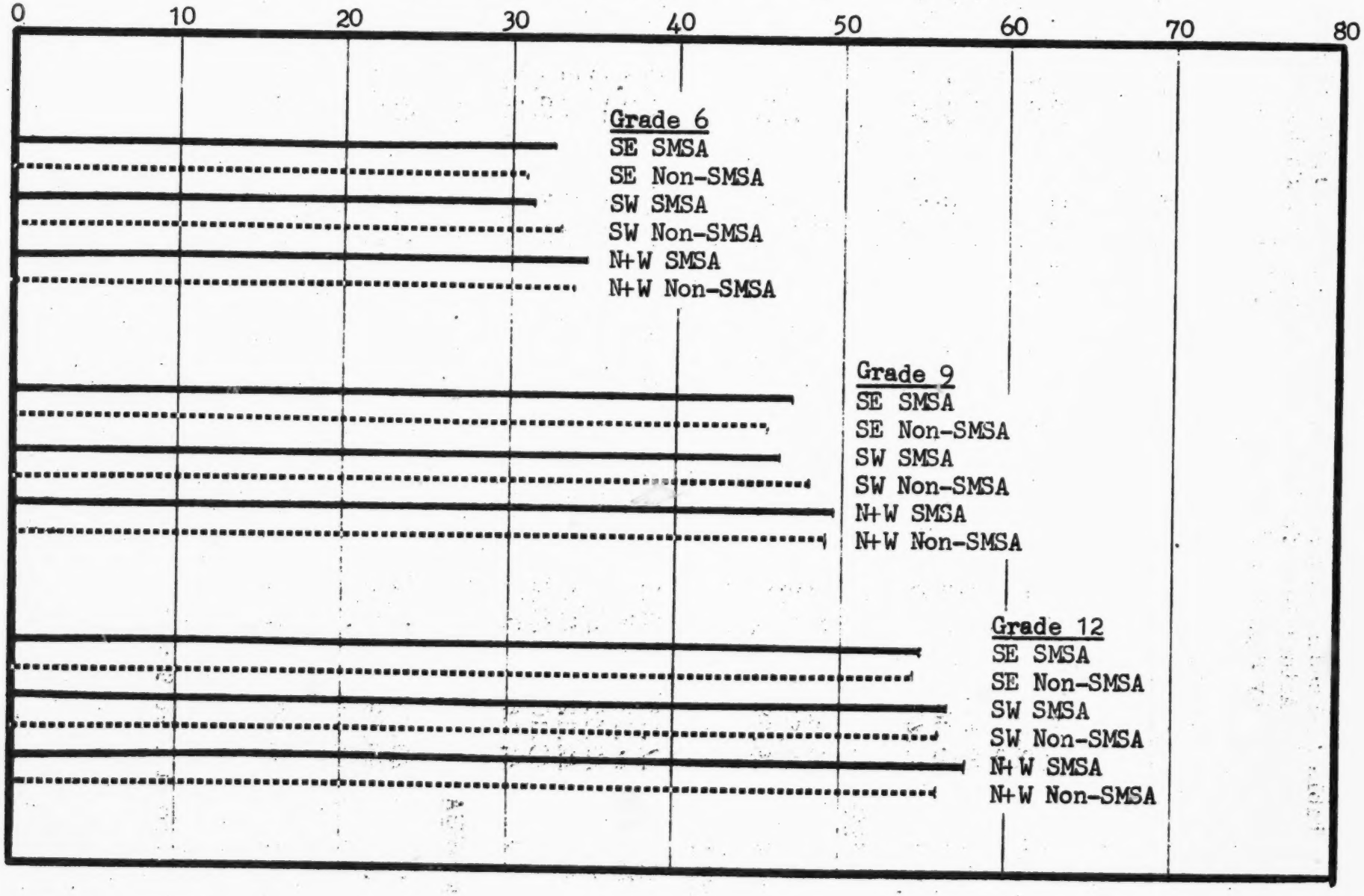


Table 1.-Reading Comprehension Test Scores Interpolated From Actual Data for White and Negro, by SMSA-NonSMSA, by Region and Single Years of Grade

	6*	7	8	9*	10	11	12*
Negro SMSA							
NE	32.16	37.5	42.7	47.97	53.2	58.4	63.56
MW	32.04	37.8	43.6	49.16	54.5	59.6	64.25
SE	29.65	34.7	39.7	44.56	49.2	53.6	57.62
SW	29.67	34.5	39.2	43.72	48.1	52.4	56.41
W	30.06	34.8	39.5	44.21	48.9	53.6	58.41
N+W	31.42	36.7	42.0	47.22	52.4	57.4	62.36
Negro NonSMSA							
SE	25.60	30.1	34.6	38.97	43.3	47.5	51.57
SW	27.83	32.9	37.9	42.60	47.0	50.8	54.16
N+W	29.28	35.6	41.6	47.16	51.9	55.6	57.94
White SMSA							
NE	44.75	51.3	57.4	63.15	68.5	73.3	77.72
MW	44.13	50.7	56.9	62.59	67.8	72.4	76.36
SE	42.55	48.8	54.9	60.58	66.0	71.0	75.74
SW	42.12	47.9	53.5	59.01	64.5	70.1	75.74
W	43.10	49.0	54.6	59.85	64.8	69.4	73.70
N+W	44.16	50.6	56.7	62.36	67.6	72.3	76.41
White NonSMSA							
SE	40.73	46.8	52.6	58.19	63.4	68.3	72.91
SW	43.69	50.0	55.9	61.47	66.6	71.2	75.35
N+W	43.61	49.8	55.6	61.10	66.2	70.9	75.16
Totals	38.97	45.2	51.3	57.02	62.4	67.5	72.09

* Actual Test Scores

Table 2.-Verbal Ability Test Scores Interpolated From Actual Data for White and Negro, by SMSA-NonSMSA, by Region and Single Years of Grade

	6*	7	8	9*	10	11	12*
Negro-SMSA							
NE	25.11	30.6	36.0	41.28	46.2	50.8	54.66
MW	24.92	31.1	37.1	42.71	47.7	51.7	54.48
SE	22.19	27.5	32.6	37.55	42.0	45.8	48.67
SW	23.14	28.2	33.1	37.70	41.8	45.4	48.05
W	23.58	29.3	34.9	40.04	44.6	48.3	50.87
N+W	24.54	30.3	36.0	41.38	46.2	50.3	53.50
Negro-NonSMSA							
SE	18.96	23.7	28.4	32.78	36.7	40.0	42.52
SW	22.13	26.9	31.6	35.92	39.8	43.1	45.51
N+W	22.87	28.6	34.2	39.33	43.7	47.0	49.09
White-SMSA							
NE	37.23	44.1	50.7	56.71	62.0	66.5	69.77
MW	36.43	43.7	50.6	56.69	61.8	65.6	67.86
SE	33.65	40.7	47.5	53.73	59.1	63.3	66.04
SW	33.61	40.3	46.8	52.90	58.4	63.0	66.63
W	35.16	42.0	48.6	54.72	60.1	64.5	67.73
N+W	36.49	43.6	50.3	56.37	61.6	65.8	68.54
White-NonSMSA							
SE	32.00	38.4	44.5	50.24	55.4	59.7	63.09
SW	35.02	41.7	48.0	53.83	59.0	63.3	66.46
N+W	35.89	42.5	48.7	54.35	59.2	63.2	65.97
Totals	31.44	38.1	44.6	50.65	56.0	60.4	63.55

* Actual Test Scores

Table 3.-Mathematics Test Scores Interpolated From Actual Data for White and Negro, by SMSA-NonSMSA, by Region and Single Years of Grade

	6*	7	8	9*	10	11	12*
Negro SMSA							
NE	22.90	28.1	32.4	35.87	37.6	38.6	38.82
MW	22.61	28.2	33.6	37.29	39.5	40.7	41.23
SE	20.73	26.2	30.8	34.48	36.0	36.7	36.80
SW	20.87	26.2	31.8	34.80	35.7	36.2	36.34
W	20.69	26.1	30.7	34.24	36.6	37.8	38.24
N+W	22.06	27.7	32.3	35.85	38.2	39.4	39.62
Negro NonSMSA							
SE	19.02	23.8	27.8	31.11	33.1	34.1	34.22
SW	20.79	26.0	30.4	33.67	35.8	36.9	37.18
N+W	21.57	27.2	32.7	36.25	37.9	38.2	38.90
White SMSA							
NE	35.03	40.4	45.3	49.68	53.3	56.1	58.02
MW	34.57	40.2	45.3	49.77	53.4	56.1	57.71
SE	32.48	37.8	42.7	46.99	50.5	53.2	54.82
SW	31.24	36.5	41.5	46.12	50.2	53.6	56.28
W	33.45	38.8	43.7	48.00	51.5	54.2	55.81
N+W	34.53	40.1	45.0	49.44	53.1	55.8	57.50
White Non-SMSA							
SE	30.88	36.1	41.0	45.44	49.2	52.2	54.27
SW	32.98	38.5	43.6	48.01	51.7	54.3	55.89
N+W	33.83	39.5	44.6	48.98	52.5	54.8	55.90
Totals	29.83	35.3	40.4	44.96	48.7	51.4	52.98

* Actual Test Scores

Table 4-Grade Level Equivalents Derived From National Means for Reading Comprehension, By Race, SMSA-Non-SMSA and Region

READING		6	7	8	9	10	11	12
NEGRO/SMSA	NE	4.9	5.8	6.6	7.4	8.3	9.2	10.2
	MW	4.9	5.8	6.7	7.6	8.6	9.5	10.3
	SE	4.6	5.3	6.1	6.9	7.7	8.4	9.1
	SW	4.6	5.3	6.0	6.8	7.5	8.2	8.9
	W	4.6	5.3	6.1	6.8	7.6	8.4	9.2
	N+W	4.8	5.6	6.5	7.3	8.2	9.1	10.0
NEGRO Non-SMSA	SE	3.9	4.6	5.3	6.0	6.7	7.4	8.1
	SW	4.3	5.1	5.8	6.6	7.3	7.9	8.5
	N+W	4.5	5.5	6.4	7.3	8.1	8.7	9.2
WHITE-SMSA	NE	6.9	8.0	9.1	10.1	11.2	12.3	13.4
	MW	6.8	7.9	9.0	10.0	11.1	12.1	13.0
	SE	6.6	7.6	8.6	9.6	10.7	11.8	12.9
	SW	6.5	7.4	8.4	9.4	10.4	11.5	12.9
	W	6.7	7.6	8.6	9.5	10.5	11.4	12.4
	N+W	6.8	7.9	8.9	10.0	11.0	12.0	13.1
WHITE Non-SMSA	SE	6.3	7.3	8.2	9.2	10.2	11.2	12.2
	SW	6.8	7.8	8.8	9.8	10.8	11.8	12.8
	N+W	6.7	7.8	8.8	9.7	10.7	11.7	12.7
	TOTAL	6.0	7.0	8.0	9.0	10.0	11.0	12.0

Table 5 - Grade Level Equivalents Derived From National Means for Verbal Ability, By Race, SMSA-Non-SMSA and Region

VERBAL ABILITY

		6	7	8	9	10	11	12
NEGRO/SMSA	NE	5.1	5.9	6.7	7.5	8.3	9.0	9.7
	MW	5.0	5.9	6.8	7.7	8.5	9.2	9.7
	SE	4.6	5.4	6.2	6.9	7.6	8.2	8.7
	SW	4.8	5.5	6.2	6.9	7.6	8.1	8.6
	W	4.8	5.7	6.5	7.3	8.0	8.6	9.0
	N+W	5.0	5.8	6.7	7.5	8.3	8.9	9.5
NEGRO Non-SMSA	SE	4.1	4.9	5.5	6.2	6.8	7.3	7.7
	SW	4.6	5.3	6.0	6.7	7.3	7.8	8.1
	N+W	4.7	5.6	6.4	7.2	7.9	8.4	8.7
WHITE/SMSA	NE	6.9	7.9	9.0	10.2	11.5	*	*
	MW	6.7	7.9	9.0	10.1	11.4	*	*
	SE	6.3	7.4	8.5	9.6	10.7	11.9	*
	SW	6.3	7.3	8.4	9.4	10.5	11.8	*
	W	6.6	7.6	8.7	9.8	10.9	12.4	*
	N+W	6.8	7.8	8.9	10.1	11.3	*	*
WHITE Non-SMSA	SE	6.1	7.0	8.0	8.9	9.9	10.8	11.8
	SW	6.5	7.5	8.5	9.6	10.7	11.9	*
	N+W	6.7	7.7	8.7	9.7	10.7	11.9	*
	TOTAL	6.0	7.0	8.0	9.0	10.0	11.0	12.0

*Grade Level Equivalents greater than 13.4 year; not calculable (see text p. 9)

Table 6 - Grade Level Equivalents Derived From National Means for Mathematics, By Race, SMSA-Non-SMSA and Region

MATHEMATICS

		6	7	8	9	10	11	12
NEGRO/SMSA	NE	4.8	5.7	6.5	7.1	7.4	7.6	7.7
	MW	4.7	5.7	6.7	7.4	7.8	8.1	8.2
	SE	4.4	5.4	6.2	6.8	7.1	7.3	7.3
	SW	4.4	5.4	6.4	6.9	7.1	7.2	7.2
	W	4.4	5.3	6.2	6.8	7.2	7.4	7.6
	N+W	4.6	5.6	6.4	7.1	7.6	7.8	7.8
NEGRO Non-SMSA	SE	4.1	4.9	5.6	6.2	6.6	6.8	6.8
	SW	4.4	5.3	6.1	6.7	7.1	7.3	7.4
	N+W	4.5	5.5	6.5	7.2	7.5	7.6	7.7
WHITE/SMSA	NE	6.9	8.0	9.1	10.3	*	*	*
	MW	6.9	7.9	9.1	10.3	*	*	*
	SE	6.5	7.5	8.5	9.5	10.6	12.4	12.7
	SW	6.3	7.2	8.2	9.3	10.5	*	*
	W	6.7	7.7	8.7	9.8	11.1	*	*
	N+W	6.9	7.9	9.0	10.2	12.1	*	*
WHITE Non-SMSA	SE	6.2	7.2	8.1	9.1	10.2	11.4	*
	SW	6.6	7.6	8.7	9.8	11.1	*	*
	N+W	6.7	7.8	8.9	10.1	11.6	*	*
	TOTAL	6.0	7.0	8.0	9.0	10.0	11.0	12.0

* Grade Level Equivalents greater than 12.6 years; not calculable (see text, p. 9).

Table 7 - Reading: Deviations of Grade Level Equivalents From National Mean Grade Level Equivalents, for Negro and White, by SMSA-Non-SMSA and Regions - Grades 6 Thru 9

		GRADE						
		6	7	8	9	10	11	12
NEGRO, SMSA	NE	-1.1	-1.2	-1.4	-1.6	-1.7	-1.8	-1.8
	MW	-1.1	-1.2	-1.3	-1.4	-1.4	-1.5	-1.7
	SE	-1.4	-1.7	-1.9	-2.1	-2.3	-2.6	-2.9
	SW	-1.4	-1.7	-2.0	-2.2	-2.5	-2.8	-3.1
	W	-1.4	-1.7	-1.9	-2.2	-2.4	-2.6	-2.8
	N+W	-1.2	-1.4	-1.5	-1.7	-1.8	-1.9	-2.0
NEGRO Non-SMSA	SE	-2.1	-2.4	-2.7	-3.0	-3.3	-3.6	-3.9
	SW	-1.7	-1.9	-2.2	-2.4	-2.7	-3.1	-3.5
	N+W	-1.5	-1.5	-1.6	-1.7	-1.9	-2.3	-2.8
WHITE, SMSA	NE	+0.9	+1.0	+1.1	+1.1	+1.2	+1.3	+1.4
	MW	+0.8	+0.9	+1.0	+1.0	+1.1	+1.1	+1.0
	SE	+0.6	+0.6	+0.6	+0.6	+0.7	+0.8	+0.9
	SW	+0.5	+0.4	+0.4	+0.4	+0.4	+0.5	+0.9
	W	+0.7	+0.6	+0.6	+0.5	+0.5	+0.4	+0.4
	N+W	+0.8	+0.9	+0.9	+1.0	+1.0	+1.0	+1.1
WHITE Non-SMSA	SE	+0.3	+0.3	+0.2	+0.2	+0.2	+0.2	+0.2
	SW	+0.8	+0.8	+0.8	+0.8	+0.8	+0.8	+0.8
	N+W	+0.7	+0.8	+0.8	+0.7	+0.7	+0.7	+0.7

Table 8 - Verbal Ability: Deviations of Grade Level Equivalents From National Mean Grade Level Equivalents, for Negro and White, by SMSA-Non-SMSA and Regions - Grades 6 through 9

		GRADE						
		6	7	8	9	10	11	12
NEGRO, SMSA	NE	-0.9	-1.1	-1.3	-1.5	-1.7	-2.0	-2.3
	MW	-1.0	-1.1	-1.2	-1.3	-1.5	-1.8	-2.3
	SE	-1.4	-1.6	-1.8	-2.1	-2.4	-2.8	-3.3
	SW	-1.2	-1.5	-1.8	-2.1	-2.4	-2.9	-3.4
	W	-1.2	-1.3	-1.5	-1.7	-2.0	-2.4	-3.0
	N+W	-1.0	-1.2	-1.3	-1.5	-1.7	-2.1	-2.5
NEGRO Non-SMSA	SE	-1.9	-2.1	-2.5	-2.8	-3.2	-3.7	-4.3
	SW	-1.4	-1.7	-2.0	-2.3	-2.7	-3.2	-3.9
	N+W	-1.3	-1.4	-1.6	-1.8	-2.1	-2.6	-3.3
WHITE, SMSA	NE	+0.9	+0.9	+1.0	+1.2	+1.5	*	*
	MW	+0.7	+0.9	+1.0	+1.1	+1.4	*	*
	SE	+0.3	+0.4	+0.5	+0.6	+0.7	+0.9	*
	SW	+0.3	+0.3	+0.4	+0.4	+0.5	+0.8	*
	W	+0.6	+0.6	+0.7	+0.8	+0.9	+1.4	*
	N+W	+0.8	+0.8	+0.9	+1.1	+1.3	*	*
WHITE Non-SMSA	SE	+0.1	+0.0	+0.0	-0.1	-0.1	-0.2	-0.2
	SW	+0.5	+0.5	+0.5	+0.6	+0.7	+0.9	*
	N+W	+0.7	+0.7	+0.7	+0.7	+0.7	+0.9	*

*See text, p. 9.

Table 9 - Mathematics: Deviations of Grade Level Equivalents From National Mean Grade Level Equivalents, for Negro and White, by SMSA-Non-SMSA and Regions - Grades 6 through 9

		GRADE						
		6	7	8	9	10	11	12
NEGRO, SMSA	NE	-1.2	-1.3	-1.5	-1.9	-2.6	-3.4	-4.2
	MW	-1.3	-1.3	-1.3	-1.6	-2.2	-2.9	-3.8
	SE	-1.6	-1.6	-1.8	-2.2	-2.9	-3.7	-4.7
	SW	-1.6	-1.6	-1.6	-2.1	-2.9	-3.8	-4.8
	W	-1.6	-1.7	-1.8	-2.2	-2.8	-3.6	-4.4
	N+W	-1.4	-1.4	-1.6	-1.9	-2.4	-3.2	-4.2
NEGRO Non-SMSA	SE	-1.9	-2.1	-2.4	-2.8	-3.4	-4.2	-5.2
	SW	-1.6	-1.7	-1.9	-2.3	-2.9	-3.7	-4.6
	N+W	-1.5	-1.5	-1.5	-1.8	-2.5	-3.4	-4.3
WHITE, SMSA	NE	+0.9	+1.0	+1.1	+1.3	*	*	*
	MW	+0.9	+0.9	+1.1	+1.3	*	*	*
	SE	+0.5	+0.5	+0.5	+0.5	+0.6	+1.4	*
	SW	+0.3	+-.2	+0.2	+0.3	+0.5	*	*
	W	+0.7	+0.7	+0.7	+0.8	+1.1	*	*
	N+W	+0.9	+0.9	+1.0	+1.2	+2.1	*	*
WHITE Non-SMSA	SE	+0.2	+0.2	+0.1	+0.1	+0.2	+0.4	*
	SW	+0.6	+0.6	+0.7	+0.8	+1.1	*	*
	N+W	+0.7	+0.8	+0.9	+1.1	+1.6	*	*

*See text, p. 9.

TABLE 10. - RANKINGS OF SMSA AND NON-SMSA REGIONS, NEGRO STUDENTS, FOR READING COMPHRENSION (R), VERBAL ABILITY (V) AND MATHEMATICS (M), GRADES 6, 9 and 12

	RANK					
GRADE 6	1	2	3	4	5	6
N+W SMSA	R,V,M					
SE SMSA			R	V	M	
SW SMSA		R,V	M			
N+W Non-SMSA		M	V	R		
SE Non-SMSA						R,V,M
SW Non-SMSA				M	R,V	
GRADE 9						
N+W SMSA	R,V	M				
SE SMSA			R	V,M		
SW SMSA			V,M	R		
N+W Non-SMSA	M	R,V				
SE Non-SMSA						R,V,M
SW Non-SMSA					R,V,M	
GRADE 12						
N+W SMSA	R,V,M					
SE SMSA			R,V	M		
SW SMSA				R,V	M	
N+W Non-SMSA		R,V,M				
SE Non-SMSA						R,V,M
SW Non-SMSA			M		R,V	

TABLE 11. - RANKINGS OF SMSA AND NON-SMSA, WHITE STUDENTS, FOR READING COMPREHENSION (R), VERBAL ABILITY (V), AND MATHEMATICS (M), GRADES 6, 9, and 12

	RANKS					
GRADE 6	1	2	3	4	5	6
N+W SMSA	R,V,M					
SE SMSA				R,V,M		
SW SMSA					R,V,M	
N+W Non-SMSA		V,M	R			
SE Non-SMSA						R,V,M
SW Non-SMSA		R	V,M			
GRADE 9						
N+W SMSA	R,V,M					
SE SMSA				R,V,M		
SW SMSA					R,V,M	
N+W Non-SMSA		V,M	R			
SE Non-SMSA						R,V,M
SW Non-SMSA		R	V,M			
GRADE 12						
N+W SMSA	R,V,M					
SE SMSA		R		V	M	
SW SMSA		V,M	R			
N+W Non-SMSA			M		R,V	
SE Non-SMSA						R,V,M
SW Non-SMSA			V	R,M		

TABLE 12.- Number of Tests at Each Rank for SMSA and Non-SMSA Regions, Negro and White Students, for All Tests and Grades (6, 9, and 12) Combined.

	RANK					
NEGRO	1	2	3	4	5	6
N+W SMSA	8	1				
SE SMSA			4	4	1	
SW SMSA		2	3	3	1	
N+W Non-SMSA	1	6	1	1		
SE Non-SMSA						9
SW Non-SMSA			1	1	7	
WHITE						
N+W SMSA	9					
SE SMSA		1		7	1	
SW SMSA		2	1		6	
N+W Non-SMSA		4	3		2	
SE Non-SMSA						9
SW Non-SMSA		2	5	2		

TABLE 13.-Achievement Test Scores Interpolated From Actual Data for Selected Races, by Single Years of Grade

READING	TEST SCORE POINTS						
Grade:	6*	7	8	9*	10	11	12*
WHITE	43.28	49.6	55.5	61.15	66.4	71.2	75.58
ORIENTAL-AMERICAN	37.79	44.9	51.6	57.67	62.9	67.1	69.95
AMERICAN-INDIAN	30.55	36.9	43.1	48.86	54.0	58.4	61.69
MEXICAN-AMERICAN	27.97	34.4	40.8	46.93	52.6	57.5	61.51
PUERTO RICAN	22.88	29.3	35.9	42.36	48.5	54.0	58.74
NEGRO	29.46	34.7	39.8	44.71	49.4	53.9	57.94
NATIONAL MEAN:	38.97	45.2	51.3	57.02	62.4	67.5	72.09

VERBAL ABILITY							
Grade:	6*	7	8	9*	10	11	12*
WHITE	35.27	42.1	48.6	54.61	59.8	64.0	66.94
ORIENTAL-AMERICAN	30.29	37.4	44.3	50.58	56.0	60.2	62.95
AMERICAN-INDIAN	24.47	30.9	37.2	42.89	47.7	51.3	53.44
MEXICAN-AMERICAN	22.24	28.9	35.5	41.58	46.9	51.0	53.69
PUERTO RICAN	17.53	24.4	31.3	38.02	44.0	49.0	52.50
NEGRO	22.59	28.0	33.3	38.31	42.7	46.4	49.04
NATIONAL MEAN:	31.44	38.1	44.6	50.65	56.0	60.3	63.55

MATHEMATICS							
Grade:	6*	7	8	9*	10	11	12*
WHITE	33.41	38.9	43.9	48.36	52.0	54.8	56.45
ORIENTAL-AMERICAN	28.94	35.8	42.1	47.68	52.0	54.7	55.48
AMERICAN-INDIAN	22.71	28.1	33.2	37.76	41.5	44.0	45.19
MEXICAN-AMERICAN	21.70	27.2	32.4	36.99	40.8	43.3	44.47
PUERTO RICAN	17.87	23.0	28.0	32.58	36.5	39.4	41.00
NEGRO	21.02	27.8	31.8	34.53	36.2	37.2	37.47
NATIONAL MEAN:	29.83	35.3	40.4	44.96	48.7	51.4	52.98

*Actual Test Scores

TABLE 14.-Grade Level Equivalents Derived From National Means for Reading, Verbal Ability and Mathematics Selected Races, 6-12

READING	GRADE LEVEL EQUIVALENTS						
Grade:	6	7	8	9	10	11	12
WHITE	6.7	7.7	8.7	9.8	10.8	11.8	12.8
ORIENTAL-AMERICAN	5.8	6.9	8.1	9.1	10.1	10.9	11.5
AMERICAN-INDIAN	4.7	5.7	6.7	7.6	8.5	9.2	9.9
MEXICAN-AMERICAN	4.3	5.3	6.3	7.3	8.2	9.1	9.8
PUERTO RICAN	3.5	4.5	5.5	6.5	7.5	8.5	9.3
NEGRO	4.5	5.3	6.1	6.9	7.7	8.4	9.2
NATIONAL MEAN:	6.0	7.0	8.0	9.0	10.0	11.0	12.0

VERBAL ABILITY							
Grade:	6	7	8	9	10	11	12
WHITE	6.6	7.6	8.7	9.7	10.9	12.2	*
ORIENTAL-AMERICAN	5.8	6.9	7.9	9.0	10.0	11.0	11.8
AMERICAN-INDIAN	5.0	5.9	6.9	7.7	8.5	9.1	9.5
MEXICAN-AMERICAN	4.6	5.6	6.6	7.5	8.4	9.1	9.6
PUERTO RICAN	3.9	4.9	6.0	7.0	7.9	8.7	9.3
NEGRO	4.7	5.5	6.3	7.0	7.7	8.3	8.7
NATIONAL MEAN:	6.0	7.0	8.0	9.0	10.0	11.0	12.0

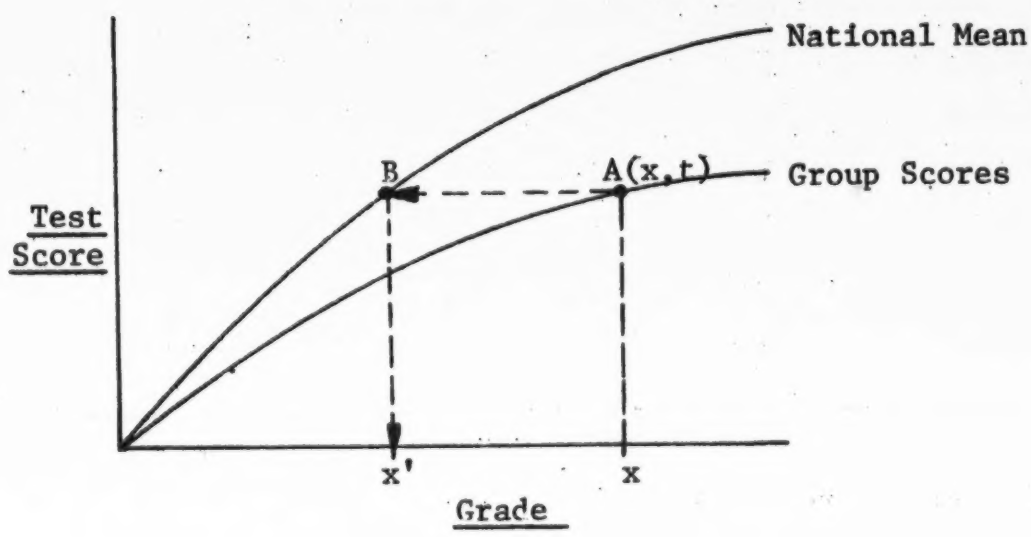
MATHEMATICS							
Grade:	6	7	8	9	10	11	12
WHITE	6.6	7.7	8.8	9.9	11.3	*	*
ORIENTAL-AMERICAN	5.8	7.1	8.4	9.7	11.3	*	*
AMERICAN-INDIAN	4.7	5.7	6.6	7.5	8.2	8.8	9.1
MEXICAN-AMERICAN	4.6	5.5	6.5	7.3	8.1	8.6	8.9
PUERTO RICAN	3.9	4.8	5.7	6.5	7.2	7.8	8.1
NEGRO	4.5	5.6	6.4	6.9	7.2	7.4	7.4
NATIONAL MEAN:	6.0	7.0	8.0	9.0	10.0	11.0	12.0

*Not calculable; see text p.9

APPENDIX: METHODOLOGY

In Technical Note Number 53, linear interpolation between test scores was used for grades 6 to 9 and grades 9 to 12 in order to obtain test scores for the intermediate grades (grades 7, 8, 10, and 11). After further examination of the distribution of actual test scores and trial fitting of various types of curves to the empirical data, it became apparent that it would be quite feasible to use curvilinear relationships for interpolation purposes. This non-linear procedure did not modify to any extent the results obtained earlier by using linear interpolation and, in fact, improved the solutions at the extreme ends (grades 6 and 12). This improvement was due to the fact that the general shape of the curves within the range bounded by the data approximated more closely the decremental learning function than a simple linear relationship.

The problem to be solved may be described by the following figure:



Assume that it is necessary to derive a grade level equivalent based on the national mean for a group whose test score at grade x is t (denoted by the point A). In graphical terms, this would mean going from A horizontally until point B is reached on the curve for the national mean, then dropping down to the x - axis; this will result in a grade level equivalent of x' for point A as measured from the national mean. (Obviously, each test score on the national mean is defined as the grade level equivalent for that score).

In more analytic terms, actual test scores for each group at grades 6, 9 and 12 were used to derive polynomials of degree 3 by assuming the existence of a 4th point at grade = 0 with test score = 0. Thus, functional relationships of the form:

$$Y = Ax^3 + Bx^2 + Cx$$

(where Y= test score for any given grade x) were derived. From these equations, test scores for grades 7, 8, 10 and 11 were calculated by letting x = 7, 8, 10 and 11 in succession.

These derived test scores (and actual scores) were then successively substituted for Y in the equation derived from national mean scores:

$$\underline{A}x^3 + \underline{B}x^2 + \underline{C}x - Y = 0$$

where $\underline{A}$, $\underline{B}$, and $\underline{C}$ are the coefficients for the equation of achievement derived from national mean scores. The solution of the roots of this equation resulted in grade level equivalents calculated from national mean scores.